In the specification:

Please amend the paragraph beginning at line 15 on page 2 as follows:

One important capability for cell research is the ability to perform cell sorting, or cytometry, based on the type, size, or function of a cell. Recent approaches to micro-cytometry have been based ~~do~~ **on** electrophoretic or electro-osmotic separation of different cell types. See A. Y. Fu, C. Spence, A. Scherer, F. H. Arnold, and S. R Quake, "A microfabricated fluorescence-activated cell sorter," Nature 17.1109-1111 (1999).

Please amend the paragraph beginning at line 21 on page 20 as follows:

By this coaction the at least one small particle is transported from upstream to downstream in microfluidic channels by the flow of fluid within these channels, while the same small particle is sorted to a selected downstream microfluidic channel under **a** photonic force.

Please amend the paragraph beginning at line 21 on page 23 as follows:

In its most basic and rudimentary form a photonic switching mechanism in accordance with the present invention uses an

optical tweezers trap. Channels, most typically formed by molding a silicone elastomer, are used to guide a fluid, such as, by way of example, water, flowing, typically continuously, in a path having the shape of an inverted letter "Y" between, by way of example, one input reservoir and two output reservoirs. In accordance with the present invention, microspheres dispersed in the water continuously flowing through the input micro-channel that forms the central leg of the "Y" are selectively directed by optical radiation pressure to a determined output channel, or a selected branch leg of the "Y". All-optical sorting is advantageous ~~i~~in that it can provide precise and ~~i~~individual manipulation of single cells or other biological samples regardless of their electrical charge or lack thereof.

Please amend the paragraph beginning at line 12 on page 29 as follows:

Optical trapping of polystyrene microspheres dispersed in water has been successfully demonstrated using an 850 nm, 15 ~~i~~μm diameter aperture, LaGuerre mode VCSEL. A 100x, 1.5 N. A. microscope objective was used to focus the optical beam from the VCSEL onto a sample plate. Fig. 3 shows a sequence of images captured by a CCD camera in which a single 5 μ~~i~~m diameter microsphere has been trapped, horizontally translated, and

released. The full three-dimensionality of the trap was verified by translating along all axes, and also by observing that when stationary Brownian motion alone was insufficient to remove the particle from the trap.

Please amend the paragraph beginning at line 23 on page 29 as follows:

The strength of this trap was measured by translating the beads at increasingly higher speeds through water and observing the point at which fluidic drag exceeded the optical trapping force. For a 10 ~~µ~~m diameter microsphere and a VCSEL driving current of 18 mA, a maximum drag speed of 6.4 ~~µ~~m/sec was observed, corresponding to a lateral trapping force of 0.6 picoNewtons. Smaller live cells (< 5 um) obtained from a mouse were also shown to be trapped by the VCSEL tweezers. However the strength of the trap was considerably less due to the lower dielectric constant and irregular structure of cells.

Please amend the paragraph beginning at line 10 on page 30 as follows:

The feasibility of photonic particle switching in microfluidic channels has also been demonstrated. In initial experiments polystyrene b~~e~~eads were used to simulate the sorting

of live cells. Microfluidic channels were fabricated in a PDMS-based silicone elastomer (Dow Corning Sylgard 184). The channels were molded by a lithographically-defined relief master. Samples were cured at room temperature over a period of 24 hours. After curing, the channels were treated in a 45 C 1-ICI bath (0. 02%, in water) for 40 minutes to increase their hydrophilicity. As shown in Figures 7a and 7b, both T-shaped and Y-shaped channels were fabricated. Similar results were obtained with each. Channels widths of 20 Am and 40 Am with depths ranging from 10 to 20 Am and lengths from 2 to 4 mm were shown. To seal the channels the molded elastomer was capped by a microscope slide cover slip. Reservoirs at the end of each channel were left open to permit the injection of fluid. Additionally, a gold electrode was inserted into each reservoir to permit **an** electr~~a~~**o**-osmotic flow to be induced within the channels. A combination of electro-osmosis and pressure was used to draw the fluids down the main channel, while sorting was performed purely by photonic pressure. Electro-osmotic fluid flow is a convenient tool for microchannels of this size, however mechanical pumping can also be used. Microspheres ranging in diameter from 0.8 Um to 10 Am were dispersed in water and shown to flow through the channels.

Please amend the paragraph beginning at line 33 on page 30 as follows:

The setup for the optical sorter is shown in Figure 8. The beam from a 70 mW, 850 nm diode laser is focused through the microscope slide cover slip onto the channels. The 100x, 1.25 numerical aperture microscope objective makes a highly focused spot, therefore allowing three-dimensional optical trapping. The position of the optical trap is moved by translating the mounted channels over the beam. Prior calibration of the optical trap strength at this power and for 5 μm diameter microspheres demonstrated a holding force of 2.8 picoNewtons. For this force the optical trap should be able to overcome the fluidic drag force of water for linear flow rates of up to 60 μm/sec.

Please amend the paragraph beginning at line 10 on page ~~33~~ 31 as follows:

A demonstration of the switching process is depicted in the sequence of images in Figures 9a-9e. The images shown here are magnified to the junction of the "T". The fluidic channels in this case were 40 μm wide and 20 μm deep. The optical trapping beam is not visible in these pictures due to the IR-blocking filter in front of the CCD camera. Microspheres with a diameter of 5 μm were drawn from the entry port with a linear fluidic

velocity of approximately 30 μm/sec. The linear velocity is halved at the exit ports since each exit channel has the same cross-sectional area as the input channel. The potential difference between the entry and exit ports was 16 V.

Please amend the paragraph beginning at line 26 on page 31 as follows:

It was determined that smaller objects were more easily trapped and transported. Larger objects feel a greater force due to the fluidic drag. Moreover, we have determined that live cells are also more difficult to manipulate in an optical trap due to their lower average index of refraction and irregular shape. Higher optical beam powers levels are necessary to rapidly switch these types of particles.